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(71) Applicant: HITACHI LTD

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(72) Inventor: OYAMA AKIHIRO

(54) SCHEDULE PLAN AND PREPARATION  
MANAGING SYSTEM

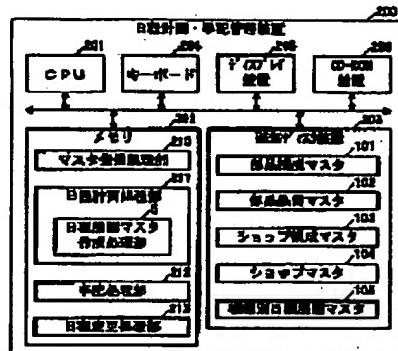
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(57) Abstract:

PROBLEM TO BE SOLVED: To easily generate, correct and change a schedule plan by deciding the delivery required days of respective sub-units from read times by means of each work process, extending the schedules of respective parts in the sub-units, deciding the order days of the respective parts and executing a preparation processing.

SOLUTION: This schedule extension master generating processing 5 of a schedule plan processing part 211 generates a schedule extension master by a machine kind 105 provided with the read times summed-up by work process and a standard time by the various combinations and registers it by relating a parts constituting master 101 to a shop constituting master 103 by a shop code. A preparation processing part 212 decides the delivery required days of the respective sub-units by the read times by work process in the master 105. Then, the schedule of the parts constituting master 101 is extended by each sub unit, and the order days and delivery days of the respective parts are decided so as to permit the respective parts of the sub-units to be



## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to scheduling and the arrangement managerial system which performs scheduling of various products, and management of arrangement. By the plant of the product with which there are many components mark with products, such as a large-sized machine and facility processing assembly industry, a standardization of components is difficult with a product, and the price of a product consists of the expensive and quite complicated bill of materials especially It applies to scheduling and the arrangement managerial system used for setting out and the assignment list of the order stage of the purchase components of the product, and a delivery stage on the operation of formulation of scheduling of the routing unit of the various products in works, and correction, and is related with an effective technique.

[0002]

[Description of the Prior Art] On the operation which manages the conventional scheduling and arrangement The bill of materials showing the bill of materials for components arrangement according to a model generally is created by design. Are a manufacture side and the bill of materials which includes the shop configuration of the routing of scheduling based on the bill of materials of this design is created independently. The lead time of each routing unit is registered into the bill of materials of manufacture, and it is applying by computer by performing the creation and registration of a bill of materials (PS) which include an item configuration (PN) and the shop configuration of a routing from the information on the bill of materials of the manufacture.

[0003] For the reason, in the case of creation of a bill of materials, lead time for schedule expansion is registered for every each part article and every routing, and it has the whole manufacturing lead time in each product unit.

[0004]

[Problem(s) to be Solved by the Invention] Conventionally, it has the configuration master which doubled both the arrangement bill of materials and the activity configuration with one bill of materials eventually created by manufacture as scheduling of each model unit, and a master of arrangement (however, a configuration master consists of a bill of materials and an item configuration), and scheduling and arrangement are performed using these item configuration and the bill of materials.

[0005] However, in order to register a routing, lead time, etc. into the bill of materials created by the design in this case by manufacture, there is a problem of taking time amount by the registration to those computers.

[0006] Moreover, although the conventional scheduling is performed by the bill of materials of the model unit of a product, since the bill of materials became a detail hierarchical quite deeply like the routing unit in content, the case of the directions of a short delivery date by delivery date modification from a customer etc. requires time amount examining of which routing lead time should be changed, and it has the problem that the schedule modification and correction take time amount.

[0007] The object of this invention solves the above-mentioned problem, and it is in offering the technique which formulation of scheduling and correction are performed and can make a change easily.

[0008] Other objects of this invention are to offer the technique which can shorten the processing time of MRP expansion.

[0009]

[Means for Solving the Problem] In scheduling and the arrangement managerial system which manages arrangement of scheduling at the time of this invention manufacturing a product, a purchase article, and a purchasing workpiece The schedule expansion master classified by model which shows the lead time which totaled according to the routing from the bill-of-materials master which shows the configuration of each part article in the subunit of a product, and the shop configuration master which shows the configuration of each routing which manufactures a product is created. It decides on the delivery need day of each subunit from the lead time according to routing, and schedule expansion of each part article

in each subunit is performed, it decides on the date of order of each part article, and arrangement processing is performed.

[0010] Conventionally, it has as one configuration master as scheduling and a master of arrangement, and scheduling and arrangement are performed using the item configuration and bill of materials. In this case, since [ which was described also in advance ] it changes deeply quite hierarchical like, the item which shows the bill of materials for scheduling has required time amount for schedule modification and correction.

[0011] So, in this invention, it has the schedule expansion master classified by model which is a master for schedule expansion of the station unit which totaled per routing, and is made to modify scheduling by the schedule expansion master classified by model of a rereeling reel.

[0012] In the master registration processing section of this invention, it is made the configuration which associates each subunit and can do it using a shop code in a certain \*\*\*\* by registering beforehand the lead time of the name of article which shows the bill of materials for every level of a subunit, an item code, quantity, and the whole subunit, and a shop code required performing correlation between a subunit and a routing as arrangement of Material-Requirements-Planning (MRP:MaterialRequirementsecond Planning) expansion, and a bill-of-materials master for procurement.

[0013] MRP performs expansion count for every product, collects an initial complement for every component and raw material, and says the thing of the processing which calculates the class and quantity of a components and a raw material required to manufacture some products, such as a mortgage of an inventory, and order, here.

[0014] Next, it classifies into the routing which said works as a station unit, for example, inspection, assembly, subassembly, and machining according to the master registration processing section as a shop configuration master for schedule expansion, the correlation configuration which associates each routing on level is performed, and the shop code for associating each routing and subunit is registered.

[0015] Next, in performing scheduling processing of a stock production in the scheduling processing section, the shop configuration master for schedule expansion and the bill-of-materials master of a subunit are associated beforehand, and per model of product, lead time is totaled and it registers according to a routing as a schedule expansion master classified by model.

[0016] Moreover, in scheduling processing of job order production, the shop configuration master for schedule expansion is created each time, correlation with the bill-of-materials master of a subunit is performed each time, lead time is totaled and the schedule expansion master classified by model of an award model unit is registered according to a routing.

[0017] In addition, the lead time of each routing of the schedule expansion master classified by model is created by totaling the lead time of a bill-of-materials master at the bill-of-materials master and shop configuration master's correlation event.

[0018] Next, the arrangement processing section decides on the delivery need day of each subunit from the lead time of each routing of this schedule expansion master classified by model, performs MRP expansion of a bill-of-materials master in each subunit unit, and decides on the date of order and the delivery date of each part article as the appearance to which the components which constitute the subunit concerned will be supplied by said delivery need day.

[0019] Moreover, the schedule modification processing section changes scheduling by modification of the lead time of this schedule expansion master classified by model at the time of usually generated scheduling modification, and only when the subunit itself is changed at the time of a design change etc., it changes a shop configuration master.

[0020] As mentioned above, by this invention, when formulation of scheduling, correction of scheduling, and modification are required, in order to have the content of the detailed lead time of a routing unit as a schedule expansion master classified by model, and to usually use the lead time of the routing unit in the schedule expansion master classified by model, there is a merit which can make correction and modification of scheduling easily.

[0021] Moreover, in MRP expansion, since it can carry out only by the bill-of-materials master of a

subunit unit, the processing time of MRP expansion is shortened. Moreover, when an activity is done by the routing which is not in the bill of materials of a design, there is a merit which can respond easily by modification and an addition of schedule expansion of only a shop configuration master.

[0022] Since formulation of scheduling and correction are performed and a change is made using the lead time and the bill-of-materials master of a subunit unit which totaled according to the routing in the schedule expansion master classified by model according to scheduling and the arrangement managerial system of this invention as mentioned above, it is possible to perform formulation of scheduling and correction and to make a change easily.

[0023]

[Embodiment of the Invention] Combining the shop configuration master which shows the configuration of the bill-of-materials master and routing which show the bill of materials of the subunit unit of a product below, the schedule expansion master classified by model which totaled lead time according to the routing is created, and scheduling and the arrangement managerial system of 1 operation gestalt which performs management of scheduling and arrangement are explained.

[0024] In scheduling and the arrangement managerial system of this operation gestalt With the product which a final-assembly product consists of some subunits, and there are some model configurations also in these subunit unit, and consists of some model configurations also in a final-assembly product unit In case a final-assembly product and its subunit perform scheduling and arrangement management of the product which takes the gestalt of a stock production or job order production, respectively, they are related with scheduling and an arrangement-related configuration master. The schedule expansion master classified by model is created from the combination of the bill-of-materials master for arrangement, and the shop configuration master for scheduling, and management of scheduling and arrangement is performed.

[0025] Drawing 1 is drawing showing the processing outline of the scheduling and the arrangement managerial system of this operation gestalt. As shown in drawing 1, scheduling and the arrangement managerial system of this operation gestalt The shop configuration master storing section 01, the bill-of-materials master storing section 02, and the schedule expansion master creation processing 5, It has the design components expression news 50, the manufacture criteria information 51, the award information 52, the schedule modification information 53, the bill-of-materials master 101, the components item master 102, the shop configuration master 103, the shop master 104, and the schedule expansion master 105 classified by model.

[0026] The shop configuration master storing section 01 is storage which stores the shop configuration master 103 and the shop master 104. The bill-of-materials master storing section 02 is equipment which stores the bill-of-materials master 101 and the components item master 102.

[0027] The schedule expansion master creation processing 5 is processing which associates the content in the bill-of-materials master 101 and the shop configuration master 103 in shop code, and creates the schedule expansion master 105 classified by model. The design components expression news 50 is the information for components arrangement that design components are expressed.

[0028] The manufacture criteria information 51 is information which shows the criteria of manufacture. The award information 52 is information which shows the content of the award. The schedule modification information 53 is information which shows schedule modification. The bill-of-materials master 101 is a file which has a shop code for relating with a routing the item which shows the configuration of each part article in the subunit of a product, and each part article of the subunit concerned.

[0029] The components item master 102 is a file which shows the content of the components. The shop configuration master 103 is a file which has a shop code for relating with the components of a subunit the item which shows the configuration of each routing which manufactures a product, and the routing concerned.

[0030] The shop master 104 is a file which shows the content of a routing. The schedule expansion master 105 classified by model is a file which has the lead time and the allowed time of each routing at the time of manufacturing a certain type of product.

[0031] This system consists of the four processing sections which perform master registration processing, scheduling processing, arrangement processing, and schedule modification processing greatly.

[0032] Drawing 2 is drawing showing the outline configuration of the scheduling and the arrangement managerial system of this operation gestalt. As shown in drawing 2, scheduling and the arrangement management equipment 200 of this operation gestalt have CPU201, memory 202, a magnetic disk drive 203, a keyboard 204, a display unit 205, and CD-ROM equipment 206.

[0033] CPU201 is equipment which controls actuation of the scheduling and arrangement management equipment 200 whole. Memory 202 is storage which loads the processing program for making it function as the master registration processing section 210, the scheduling processing section 211, the arrangement processing section 212, and the schedule modification processing section 213, and its data.

[0034] A magnetic disk drive 203 is storage which is equivalent to the shop configuration master storing section 01 and the bill-of-materials master storing section 02, and stores the data of said processing program and bill-of-materials master 101, the components item master 102, and the schedule expansion master 105 grade classified by model.

[0035] A keyboard 204 is equipment which performs the operator guidance accompanying processing and the entry of data of said processing program. A display unit 205 is equipment which displays the processing result accompanying processing of said processing program etc. CD-ROM equipment 206 is equipment which reads the medium which recorded said processing program.

[0036] Moreover, scheduling and arrangement management equipment 200 have the master registration processing section 210, the scheduling processing section 211, the arrangement processing section 212, and the schedule modification processing section 213.

[0037] The master registration processing section 210 is the processing section which registers the bill-of-materials master 101 and the components item master 102, the shop configuration master 103, and the shop master 104. The scheduling processing section 211 is the processing section which creates the schedule expansion master 105 classified by model by the schedule expansion master creation processing 5, and is registered.

[0038] The arrangement processing section 212 is the processing section in which schedule expansion is performed by the schedule expansion master 105 classified by model, it decides on the delivery need day of each subunit, and schedule expansion of the bill-of-materials master 101 is performed in each subunit unit, to which each part article of the subunit concerned will be supplied by said delivery need day and which decides on the date of order and the delivery date of each part article like.

[0039] The schedule modification processing section 213 is the processing section which makes a schedule change by selecting the model of product which changes scheduling using the schedule modification information 53, calling the schedule expansion master 105 classified by model of the selected model, and changing the lead time of the schedule expansion master 105 classified by model.

[0040] After being recorded on record media, such as CD-ROM, and being stored in a magnetic disk etc., the program for operating scheduling and arrangement management equipment 200 as the master registration processing section 210, the scheduling processing section 211, the arrangement processing section 212, and the schedule modification processing section 213 shall be loaded to memory, and shall be performed. In addition, other media other than CD-ROM are sufficient as the medium which records said program.

[0041] In the master registration processing section 210, according to the design components expression news 50 for components arrangement, a bill of materials and components items are inputted, the bill-of-materials master 101 and the components item master 102 of the bill-of-materials master storing section 02 are registered, a shop configuration and shop items are inputted according to the manufacture criteria information 51 for scheduling, and the shop configuration master 103 and the shop master 104 of the shop configuration master storing section 01 are registered.

[0042] Next, in the schedule expansion master creation processing 5 of the scheduling processing section 211, the bill-of-materials master 101 and the shop configuration master 103 are associated in shop code, and the schedule expansion master 105 classified by model with the lead time and the

allowed time which totaled according to the routing with those various combination is created and registered.

[0043] In the arrangement processing section 212, the lead time according to routing of the schedule expansion master 105 classified by model determines the delivery need day of each subunit, and it decides on the date of order and the delivery date of each part article as the appearance to which schedule expansion of the bill-of-materials master 101 is performed in each subunit unit and to which each part article of the subunit concerned will be supplied by said delivery need day.

[0044] The arrangement processing section 212 performs schedule expansion per subunit only using the bill-of-materials master 101 of each subunit in that case. It decides on the delivery need day of each part article like, and back WORD expansion may be carried out by the delivery lead time of each part article, and you may decide on the date of order of each part article as the appearance by which elegance is all supplied on the delivery date of the components which are needed first by the subunit concerned and by which each part article is supplied on said delivery need day.

[0045] In the schedule modification processing section 213, the product model which makes a schedule change is selected from the schedule modification information 53, the schedule expansion master 105 classified by model suitable for a selection model is called, modification correction of the lead time in the schedule expansion master 105 classified by model is made, and re-scheduling is performed.

[0046] In addition, although the same equipment shall perform each processing of the master registration processing section 210, the scheduling processing section 211, the arrangement processing section 212, and the schedule modification processing section 213 in drawing 2, it is good also as a system configuration which shall perform each processing with another equipment and consists of two or more equipments.

[0047] Detail explanation is given to below about master registration processing of scheduling and an arrangement managerial system, scheduling processing, and arrangement processing of this operation gestalt. Master registration processing is explained first.

[0048] Drawing 3 is drawing showing the outline of the bill of materials of this operation gestalt. In drawing 3, each field surrounded with the broken line expresses the subunit which constitutes a product, for example, Body X consists of a sub-assembly A which is a subunit, and a purchase article G, and the sub-assembly A of a subunit consists of a sub-assembly B which is the subunit, and a sub-assembly C.

[0049] Drawing 4 is drawing showing the example of the bill-of-materials master 101 of this operation gestalt. In registration of the bill-of-materials master 101 for the arrangement for MRP expansion, the body of a product is beforehand divided hierarchical per subunit like the broken line of drawing 3, and the level number which shows the hierarchy to whom each subunit belongs is added.

[0050] Next, the shop code (code which shows its post configuration) for registering the level, the name of article, the item code, the quantity, the lead time (LT), and the allowed time (ST) of the item, and relating each part article between a final-assembly product unit and each subunit and in a subunit with a routing is registered like drawing 4 as an item which shows the configuration of each part article in the subunit of a product.

[0051] In scheduling and the arrangement managerial system of this operation gestalt, at the time of MRP expansion, elegance all is not developed per product like the former, but it develops only per bill of materials of each subunit associated by the shop code. In short, a shop code develops in the same bill-of-materials unit.

[0052] In this case, \*\*\*\* is attached per a product unit or subunit, and it has composition it relates each part article activity with direct procurement / activity items like drawing 5 and drawing 6, and is possible in \*\*\*\* within a product unit or a subunit unit in the shop code of the bill-of-materials master 101 of each subunit, and shop code of the shop configuration master 103.

[0053] Drawing 5 is drawing showing the example of correlation with direct procurement / activity items of \*\*\*\* of this operation gestalt. The product or subunit shown by \*\*\*\* #A as shown in drawing 5 is related with the rigging activity expressed with KU by associating the shop code of the bill-of-materials master 101 of each subunit, and the shop code of the shop configuration master 103.

[0054] Drawing 6 is drawing showing the example of correlation in the case of having two or more

model configurations by each subunit of this operation gestalt. Even when there is a model configuration of some [ the subunit which constitutes a final-assembly product and it ], the product and subunit can be related with a specific components activity, and half-finished products B and the subunit which are shown with the broken line of drawing 6 are related with the components activity of rigging etc. by associating the shop code of the bill-of-materials master 101 of each subunit, and the shop code of the shop configuration master 103.

[0055] Next, according to registration of the shop configuration master 103 for schedule expansion, the work content of a routing is classified, for example like drawing 7, and a shop configuration is created by it.

[0056] Drawing 7 is drawing showing an example of the shop configuration of this operation gestalt. As shown in drawing 7, the routing which performs manufacture of a final-assembly product or each subunit is classified into the routing called inspection, rigging, a machine sub-assembly, substrate assembly, and machining according to scheduling and the arrangement managerial system of this operation gestalt, and KE, KU, MB, PB, and MT are set up as those shop codes, respectively.

[0057] Drawing 8 is drawing showing the example of the shop configuration master 103 of this operation gestalt. As shown in drawing 8, in scheduling and the arrangement managerial system of this operation gestalt, the shop code for relating with the components of a subunit the shop name which shows said level of a routing according to which it was classified, and the name of the routing, and the routing concerned, and LT and ST are registered into the shop configuration master 103 as an item which shows the configuration of each routing which manufactures a product like drawing 7. In order to perform correlation with the routing and subunit which were shown in the shop name of the shop configuration master 103, the shop code corresponding to a shop name is registered into the shop configuration master 103 like drawing 8.

[0058] In the scheduling processing in the case of performing a stock production, the shop configuration master 103 in a model unit required for production and the bill-of-materials master 101 of the subunit applied to the model are developed like drawing 9, and automatic correlation is performed in shop code, it registers per model, and the schedule expansion master 105 classified by model according to a model like drawing 10 is registered.

[0059] Moreover, in the scheduling processing in the case of performing job order production, the shop configuration master 103 for schedule expansion is created each time, it relates by the bill-of-materials master 101 and manual of a subunit, and the schedule expansion master 105 classified by model of an award model unit is created and registered.

[0060] Drawing 9 is drawing showing the outline of expansion of the shop configuration master 103 in a model unit required for production of this operation gestalt, and the bill-of-materials master 101 of the subunit applied to the model. As shown in drawing 9, the bill-of-materials master 101-1 of a subunit - the bill-of-materials master 101-4 are related with each routing of rigging of the shop configuration master 103, a machine sub-assembly, substrate assembly, and machining.

[0061] Drawing 10 is drawing showing the example of the schedule expansion master 105 classified by model of this operation gestalt. The lead time of each routing of the schedule expansion master 105 classified by model shown in drawing 10 is set up by totaling the lead time of the bill-of-materials master 101 of each subunit at the bill-of-materials master 101 and shop configuration master's 103 correlation event.

[0062] Next, in arrangement processing, it decides on the delivery need day of each subunit from the lead time of each routing of this schedule expansion master 105 classified by model, MRP expansion of the bill-of-materials master 101 is performed in each subunit unit, and it decides on the date of order and the delivery date of each part article as the appearance to which the components which constitute the subunit concerned will be supplied by said delivery need day.

[0063] Moreover, when modification of scheduling arises, in schedule modification processing, the model of product which changes scheduling using the schedule modification information 53 is selected, the schedule expansion master 105 classified by model of the selected model is called, and only the schedule expansion master 105 classified by model is changed. In arrangement processing, it decides on

the delivery need day of each subunit from this changed lead time of each routing of the schedule expansion master 105 classified by model, and MRP expansion of the bill-of-materials master 101 is performed in each subunit unit, and it decides on the date of order and the delivery date of each part article after scheduling modification.

[0064] Drawing 11 is drawing showing the example of correction of the schedule expansion master 105 classified by model at the time of schedule modification of this operation gestalt. At the time of schedule modification by the civil war and disturbance of scheduling (delivery date modification, a defect, deficiency, etc. of a user) which are generated daily, a change by the bill-of-materials master 101 or the shop configuration master 103 is not made, but the lead time of the schedule expansion master 105 classified by model etc. is changed like drawing 11 R> 1.

[0065] However, when the lead time of the bill-of-materials master 101 changes substantially by a design change etc., it is made to change the bill-of-materials master 101, and enables it to make a schedule change easily.

[0066] Drawing 12 is drawing showing the outline of the delivery date decision of this operation gestalt. In the arrangement processing by MRP expansion, the bill-of-materials master 101 of only a subunit unit is developed, and it decides on the date of order and a delivery date.

[0067] However, the schedule expansion by the schedule expansion master 105 classified by model determines a delivery date like drawing 12. The approach of supplying which will be packed after deciding on the date of order by the back WORD type by the delivery lead time of each components unit on the delivery need day of the earliest components of each subunit unit if the delivery need day in each subunit is decided, Two kinds of delivery approaches supplied according to the delivery need day of each routing of a subunit shall be taken.

[0068] In the subunit shown in drawing 12 using the bill-of-materials master 101-4 like When a delivery date is [ the longest delivery lead time ] ten days on October 20, After deciding on the date of order of the earliest components of a subunit unit on October 10, each part article may be supplied according to the delivery need day [ packing other components according to the date of order ] which you may make it supply and is each routing of a subunit.

[0069] Since formulation of scheduling and correction are performed and a change is made using the bill-of-materials master of the lead time which totaled according to the routing in the schedule expansion master classified by model according to [ like ] scheduling and the arrangement managerial system of this operation gestalt and the subunit unit which were explained above, it is possible to perform formulation of scheduling and correction and to make a change easily.

[0070] Moreover, according to scheduling and the arrangement managerial system of this operation gestalt, since MRP expansion is performed only by the bill-of-materials master of a subunit unit, it is possible to shorten the processing time of MRP expansion.

[0071]

[Effect of the Invention] Since according to this invention formulation of scheduling and correction are performed and a change is made using the lead time and the bill-of-materials master of a subunit unit which totaled according to the routing in the schedule expansion master classified by model, it is possible to perform formulation of scheduling and correction and to make a change easily.

**\* NOTICES \***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
  2. \*\*\*\* shows the word which can not be translated.
  3. In the drawings, any words are not translated.
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**CLAIMS**

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**[Claim(s)]**

[Claim 1] In scheduling at the time of manufacturing a product, or scheduling and the arrangement managerial system which manage components arrangement The bill-of-materials master which has a shop code for relating with a routing the item which shows the configuration of each part article in the subunit of a product, and each part article of the subunit concerned, The master registration processing section which registers the shop configuration master which has a shop code for relating with the components of a subunit the item which shows the configuration of each routing which manufactures a product, and the routing concerned, The scheduling processing section which creates and registers the schedule expansion master classified by model which has the lead time of each routing at the time of associating the content in said bill-of-materials master and a shop configuration master in shop code, and manufacturing a certain type of product, Said schedule expansion master classified by model determines the delivery need day of each subunit. Scheduling and the arrangement managerial system characterized by having the arrangement processing section in which schedule expansion of a bill-of-materials master is performed in each subunit unit, to which each part article of the subunit concerned will be supplied by said delivery need day, and which decides on the date of order and the delivery date of each part article like.

[Claim 2] Said arrangement processing section performs schedule expansion per subunit only using the bill-of-materials master of each subunit. It decides on the delivery need day of each part article as the appearance by which elegance is all supplied on the delivery date of the components which are needed first by the subunit concerned. Scheduling and the arrangement managerial system indicated by claim 1 characterized by being the thing by which each part article is supplied on said delivery need day, and which carries out back WORD expansion by the delivery lead time of each part article like, and decides on the date of order of each part article.

[Claim 3] Scheduling and the arrangement managerial system indicated by either claim 1 characterized by having the schedule modification processing section which makes a schedule change by selecting the model of product which changes scheduling using schedule modification information, calling the schedule expansion master classified by model of the selected model, and changing the lead time of the schedule expansion master classified by model concerned, or claim 2.

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[Translation done.]